Relation of Size of Trees to Stumpage Values and Profits

WITH SPECIAL REFERENCE TO HARDWOODS

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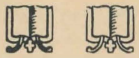

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Foreword

The Edgar Lumber Company of Wesson, Arkansas, of which Mr. G. P. Gemmill is manager, had a problem of operating on small-sized shortleaf pine timber after the larger timber had been cut. It was found that their operation was not profitable. Mr. Gemmill stated in a paper printed in proceedings of the Southern Logging Association that he was greatly assisted in solving their problem by an article by W. W. Ashe on "The Economic Waste of Cutting Small Timber." He said:

"Since no two logging jobs are alike, all of the tables given by Mr. Ashe on logging costs were tested in our woods and mill, a month being the period of time used in determining the average of logs cut, and we were forced to conclude that he was conservative in his figures."

RELATION OF SIZE OF TREE TO LOGGING COSTS STUMPAGE VALUES AND PROFITS

If a mill manager knew he was cutting timber which entailed a loss of $10 to $15 a thousand feet, he would have a nervous breakdown. Yet there are many cases of this kind. The big trees are the shock absorbers that prevent the nervous breakdown of the manager. Two trees standing cheek by jowl can be cut at the same mill. One may produce loss at a rate of $15 a thousand feet, and the other show a realization value of more han $25 a thousand feet. The operator may never know it. The bookkeeper deals in averages. Only the stop-watch and a check of grades will show it.

YELLOW POPLAR LUMBER

The trees producing such losses, though numerous, have low volume, They are small. Their loss is absorbed by the larger trees. It requires the loss from 28 ten inch trees to dissolve the profits in one thirty-inch yellow poplar. The larger trees with their high profits carry the relatively enormous losses of the smaller ones, these small trees which the operator thinks he **must** take to secure tonnage—tonnage, I almost say that facetiously, for it is value not tonnage which insures the profit of an operation. They are the trees which he fears, he might leave for someone else to cut. The tomb of the Bishop of Colchester bears this inscription: "I shall come this way but once", and most operators have taken that as their motto, "I shall come this way but once, there let me clean up."

By coincidence, as this paper was being written, the mail brought for criticism figures showing tests conducted at a large operation, the management of which is trying to determine what size it is and what size it is not profitable to cut, and how much profit or how much loss the different sizes produce. Certain sizes show an average loss equal to the total average profit, but nevertheless, it is undoubtedly a most successful operation. Had these findings, however, been made by an engineer elsewhere than at their own operation, their acceptance probably would have been slow.

LARGE TREES THE MONEY MAKERS

It is difficult to discuss sawmilling costs and values. Each operator is an impressionist. but impressed only by his own operation. Each operation has its own peculiar features, and no operator believes that figures taken elsewhere are applicable to his conditions. But irrespecive of conditions, there are certain laws or rules of cost which are common to all. One is, the increase in the cost of production with decrease in size of the log. In presenting a case to you which involves this principle, one has been selected which was worked out at a band hardwod mill in the mountains of North Carolina. Though a number of different species were being cut at this mill, poplar formed about 20% of the cut, and this is the species employed in making comparisons.

In the mixed stands of the Appalachians, poplar can be regarded as the standard and the money maker, and while other species vary widely in their proportion and may be entirely absent, the golden columns of poplar are prevailing present.

Table 1 shows for trees of different size the profit or loss, including stumpage value, that is, the realization value.

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The rapid increase in logging costs with smaller diameters is noteworthy. While it costs $25 a 1,000 feet to manufacture 21-inch trees, it costs nearly $40 to manufacture 10-inch trees. The woods and sawing costs double increasing from $14 to $28 for the same sizes. Equally as signifcant is the decrease in the selling value of the lumber from trees of the smaller size and the high realization value of the produce of those of large size is as noteworthy—twenty inch stumpage having a realization value of $13 while that of thirty inch trees have twice that value. It should be noted that the fourteen inch tree produces practically neither profit nor loss and has no stumpage value under the operating costs which are obtained. This size tree may be called the neutral diameter. In case the logging costs are higher, as for example if skidding costs increase $2 per thousand feet, in order to reach less accessible timber, the diameter of the neutral trees automatically rises. If logging costs rise or if the price of lumber falls this diameter likewise rises. If logging costs are lower or if the value of lumber increases, this diameter falls. It is not fixed but varies not only in different operations but in the different parts of the same operation. It is not the same for oak or hickory as for poplar even on the same spot, since not only is the cost of their operation higher than that of poplar, but their product sells upon a relatively different scale.

Table 1.—Relation of Size of Trees to Operating Costs and Selling Prices of Yellow Poplar Lumber

Diameter of Trees	Logging Costs Which Vary with Size of Log	Logging Costs Which Do not Vary with Size of Log	Total Manufacturing Cost	Selling Price Yellow Poplar Lumber	Profit or Loss per 1,000 including stumpage
10 inches	$ 27.65	$ 11.50	$ 39.15	$ 26.68	$ 12.47 Loss
11 "	24.70	$11.50	36.20	27.70	6.50 "
12 "	22.35	11.50	33.85	28.80	5.05 "
13 "	19.35	11.50	31.85	29.85	2.00 "
14 "	18.95	11.50	30.45	30.90	.50 Profit
15 "	17.70	11.50	29.20	32.00	2.80 "
16 "	16.70	11.50	28.20	33.20	5.00 "
17 "	16.00	11.50	27.50	34.50	7.00 "
18 "	15.30	11.50	26.80	35.95	9.15 "
19 "	14.70	11.50	26.20	37.35	11.15 "
20 "	14.15	11.50	25.65	38.80	13.15 "
21 "	13.70	11.50	25.20	40.20	15.00 "
22 "	13.20	11.50	24.70	41.65	16.95 "
23 "	12.75	11.50	24.25	43.05	18.80 "
24 "	12.40	11.50	23.90	44.50	20.60 "
25 "	12.15	11.50	23.65	45.80	22.15 "
30 "	11.60	11.50	23.10	50.10	27.10 "

Note to Table 1.—Average cost per 1,000 feet of variables: Felling $2.00; Skidding $6.00 Loading and railroad haul $2.00; Milling $3.75; Other costs which do not vary or vary slightly; railroad construction $2.00; Inspection and loading $2.00; selling $2.00; Office $3.00; Depreciation $2.50. Total average cost for poplar $25.25 per 1,000 feet, 7 logs per 1,000 feet.

Inspection, stacking and loading are variables which change directly in many cases with the output of the mill. If the mill cuts smaller timber about the same number of pieces may be produced as if it ran to its capacity upon large timber. The same amount of labor may be required resulting in an increased cost per 1,000 ft. for these items. Similarly such reduced daily output may result in increased cost per 1,000 feet on account of salaries and repairs.

Although there should be materially reduced cost in the above items amounting in case 20 per cent of the timber, smaller sizes, were left, there would be an increase in railroad construction costs from $2.00 to $2.50 per 1,000 feet, and there would be a similar increase in the relative cost of roads, skidways, buildings, setting skidders, etc.; and unless the operation were placed upon a permanent basis a proportionate increase in the sawmill cost per 1,000 feet. In the case under consideration the increase in these items will just about offset the decreased costs per 1,000 feet from salaries, grading, loading, etc.

That is it seems that in the average railroad operation it would be profitable, in case a large amount of small timber is being cut along with large timber, to leave small trees to an amount of 20 to 25 per cent of the total volume without in any way increasing the cost of production and probably with the result of decreasing it. Such small timber supported by a number of medium sized trees for quality growth might form a fair basis for a second cut.

VARIABLE AND FIXED MANUFACTURING COSTS

It should be explained that these data were secured under ordinary conditions that many crews or skidding operations were timed. There are two classes of logging costs. Those which vary with the size of the log and those which do not. Those which do vary are the cost of felling and cutting up, skidding and bunching, whether by team or by using any form of mechanical skidder, hauling logs, whether by railroad or by truck (but not hauling lumber), sawing at the mill and to a more limited extent stacking and loading. Some methods of skidding are more efficient in handling large logs, some in handling small.

Selling, railroad and mill construction, inspection, management and depreciations are costs (general overhead costs) which do not vary with the size of the log. On the other hand, certain costs in woods operations, such as camps, roads, skidways, etc., are to be distributed in the nature of minor overheads to all the timber for which they are used, in the manner which I have explained in a previous paper presented to this Association on the subject of the operation of the low grade top log.

A heavier wood, such as oak or a species of low grade like beech, birch, maple or hemlock, would give even more positive results than are shown for poplar. In the case of oak, beech, maple and hickory, the average logging and milling costs would be at least $2 per thousand more than are here given for poplar. In the case of hemlock, beech and maple not only do the smaller sized trees produce lumber selling for less than that from a poplar tree of the same size, but the lumber from the larger trees also sells for much less. This is especially true in the case of hemlock and beech. Beech, under the high logging costs which prevail generally throughout the Appalachians must be of large size to return much more than stumpage value.

The lumber value, on which the average prices of lumber of trees of different size are based, are $87 for firs and seconds,$80 for saps, $40 for No. 2A common, $17 for No. 2B common. Some mills are possibly not averaging quite so much, while others which enjoy the benefits of lower freight rates, may secure a somewhat higher f.o.b. average price for different grades, but in such case this higher average price is probably offset by higher woods logging costs due to higher labor charges. The top diameter to which cutting was done varies from eight inches in the smallest sized trees to fourteen inches in thirty inch trees which is a point at which the stem forks.

Table 2.—Profits per 1,000 Board Feet in Operating Yellow Poplar Trees of Different Diameters if Stumpage is Regarded as Having a Uniform Value of $10.00 per 1,000 Board Feet. All Costs as in Table 1

Diameter of Trees	Cost of Manufacture per 1,000	Cost ofproduction stumpage $10 per 1.000 ft.	Selling Price of lumber per 1,000 feet	Profit or Loss p er 1,000 feeet
10 inches	$ 39.15	$ 49.15	$ 26.68	$ 22.47 Loss
12 "	33.85	43.85	23.80	15.05 "
14 "	30.45	40.45	30.90	9.55 "
16 "	28.20	38.20	33.20	5.00 "
19 "	25.70	35.70	37.35	2.65 Profit
20 "	25.65	35.65	38.80	3.15 "
21 "	25.20	35.20	40.20	5.00 "
25 "	23.65	33.65	45.80	12.15 "
30 "	23.10	33.10	50.10	17.00 "

Table 3.—Stumpage Value per 1,000 Feet of Yellow Poplar Trees of Different Sizes, Regarding profits as 10 per Cent of the Operating Costs per 1,0000 Feet (Turnover)-Costs as in Table 1.

Diameter of Trees	Operating Costs per 1,000 feeet	Operating Costs plus 10 per cent	Selling Value of Lumber	Value of Stumpage
10 inches	$ 39.15	$ 43.06	$ 26.68	—$ 16.38
12 "	33.85	37.25	28.80	— 8.43
14 "	30.45	33.49	30.90	— 2.59
15 "	29.20	32.12	32.00	— .12
16 "	28.20	31.02	33.20	+ 2.18
17 "	27.50	30.25	34.50	+ 4.25
20 "	25.65	28.31	38.50	+ 10.58
25 "	23.65	26.01	45.80	+ 18.79
30 "	23.10	25.41	50.10	+ 24.69

NEGATIVE STUMPAGE VALUES

Table 2 shows the profits per thousand board feet in operating trees of different diameters, if stumpage is regarded as having a uniform value of $10. It is manifestly unfair, however, to assign a stumpage value of $10 to a tree which shows a negative operating value. Stumpage value must be regarded as the difference between selling price and operating costs after allowing a liberal profit to the operator upon his investment and the risk of the operation. In order to determine a more reasonable basis for stumpage Table 3 has been prepared. It has been assumed that in a large operation established upon a permanent basis 10% upon the turnover,—the costs of operation of trees of each diameter—would assure a reasonable profit. Stumpage values derived in this manner which is logical since there is an equal apportionment of profit upon every dollar of cost in production, show a negative stumpage value of nearly $20 for a ten inch poplar, and under average milling cost of $27, the neutral diameter is not reached until a sixteen inch tree is cut, above which size timber rapidly increases in value with each succeeding size until thirty inch, where logging costs fall to $24 stumpage, has a value in excess of $23 a thousand.

NEW FORESTS FOR OLD

While many of you men are primarily interested in the technical side of the industry as managers rather than as owners, yet owners are in large measure guided by your judgment as to policies and if you should decide, after a careful engineering analysis of your situation, that more conservative cutting embodying plans for a permanent yield were possible, your views would be given large weight. Ten years ago it might have been said that the time for planing for a permanent operation in the Appalachains is not yet ripe, but in this connection let me present the conditions in Arkansas in the yellow pine belt:

Five years ago it would have been held impossible for the mills to have organized on a perpetual cutting basis, but today seven concerns in that state with aggregate holdings of 1,300,000 acres, but some of the holdings small, are credited with managing their properties for permanent cut. It may be necessary for some to reduce the size of their operation, at least temporarily, but cutting is expected to continue and mills to run, trade to be supplied in an unlimited future. It is being brought about largely through the recognition of certain principles which engineers have brought to their attention and their conviction that pine timber in the East, though now subject to disastrous competition from Western fir, must have a future. This conviction of the possibility of operating for permanent cutting is chiefly a result of the action of one company which became convinced The others followed. Five years ago, it would have been impossible. There has been ni change in eco- years ago this would have been impossible. There has been no charge in eco-

reduced the margin of profit still closer in pine operations. At least one of these concerns is at present engaged in study of logging costs. A knowledge of such cost is fundamental to decideing upon any method of cutting, looking toward permanent yield. It is also desirable information to have to be in a position to decide which and where it is profitable to cut. It is noteworthy in regard to the situation in Arkansas that these owners of one million three hundred thousand acres of land have had the incentive of no special legislation, none of any kind ever having been passed by the Legislature of that State. There is not even a State Forester. But after being convinced that there is little or no profit in cutting smaller trees and that this does not mean just saplings but trees of a size which are yet well within the class which has been assumed to be merchantable, it was a logical step to make plans for securing the advantage of the growth and increased value of these small trees. A considerable portion of the pine lands of Arkansas which are being managed for permanent yield lie within the Ouachita Mountains, and while these points are not so high nor so rugged as the Appalachains, pine sells for less than the Appalachain hardwoods and the stand per acre will seldom be as much as four thousand feet, which is considered a low stand to justify a successful operation.

The President of the Hardwood Institute, in a recent address before the National Hardwood Association, called attention to a specious argument which was being employed by promoters of the use of substitutes for lumber in preaching that the demolition of the forests for the production of lumber is unpatriotic and a national calamity. Now it seems strange, but I myself have heard echoes of such a charge. If it is being effectively used as he believes, and perhaps it has had a sub-conscious reflection upon many of us, unless we are hypersensitive, why not counter.

VIRGIN FOREST IS STATIC

"The old forest is static, decay balances growth, the stand merely is the uninterrupted operation of natural conditions. It represents inert capital. Its benefits are limited. If it is converted into lumber and the lumber used for industrial purposes and at the same time the woodland is kept working, growing more timber, it has become active capital. Its lumber is a commodity of commerce. The canopy of foliage of young trees performs the same function as effectively as doty veterans, and the soil yearly adds volume, quality and value to a new stand."

But this result implies that the soil and the woods growing thereon are kept at work and that business principles are applied to the management of the property, and in place of being used as a source of mere temporary operation for a sawmill, it becomes a permanent productive unit in the economy of the nation, but cutting for permanent yield. I can go thus far in offering a solution to this problem. The case of the Appalachain operator today is not materially different from that of the Arkansas pine operator five years ago. The pine operators in Arkansas faced a similar problem. They are today in a fair way to allay the prejudices against them as destroyers of value in that state by creating new values and by cutting so that new forests will replace the old ones. The important point in this connection is that the action of these people is removing or breaking down this feeling adverse to lumbermen, by allaying the animosity which in the opinion of Mr. Edwards is being engineered by the promoters of substitutes for lumber. It is being done primarily not from any altruistic motives, not from any desire to create a friendlier feeling toward an industry which for several decades has had many hard knocks, but it is being done because these companies have come to believe, have been convinced as a matter of fact, that it will be profitable.

The recognition of hardwod operation of certain definite principles will,

I believe lead them to the same logical conclusion—

That it costs far more to operate smaller trees than the large.

That the lumber from the larger trees has a much larger selling value than that from smaller timber.

That smaller trees in a stand have a very low or even negative stumpage value compared with the larger trees and leaving them represents no investment or a low investment.

That smaller trees when increased and isolated by having the larger trees removed increase in size and value at an extremely high rate.

That the land and growing stock thereon can be converted into a safe investment.